A NEW SPECIES OF *LEIOPHRON* NEES (HYMENOPTERA: BRACONIDAE, EUPHORINAE) WITH OBSERVATIONS ON ITS BIOLOGY AND THAT OF ITS HOST, *PLAGIOGNATHUS* SP. (HETEROPTERA: MIRIDAE)[1]

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ABSTRACT

The euphorine braconid *Leiophron plagiognathi* is a parasite of *Plagiognathus* sp. (Heteroptera: Miridae), which breeds on *Spirea latifolia* L. The species and its final instar larva are described from Belleville, Ontario, Canada. Brief observations on the life history of both species show that *L. plagiognathi* overwinters in the cocoon in soil and strikes early instar nymphs of *Plagiognathus* in June. The larva develops chiefly in the adult, and in 1962 and 1963 emerged in July. *L. plagiognathi* has one generation per annum.

This paper is the first of a series on insect parasitism of Canadian Heteroptera. It describes a new species of *Leiophron* Nees reared from *Plagiognathus* sp. on *Spirea latifolia* L., and gives observations on the seasonal occurrence and development of parasite and host in 1962 and 1963. *Leiophron* species attack nymphs of Miridae. Except for a few records, e.g., Menzel, 1924, 1926, from Java; Lean, 1926, and Wilkinson, 1926, from West Africa; Brindley, 1939, from England; and Muesebeck, 1936, from the United States, the parasite species have not been associated with their hosts. Leston (1961) listed 51 English mirids from which euphorine larvae were dissected, but the species are unknown, as the larvae were not associated with adult specimens.

Leiophron plagiognathi sp. n.

Though literature refers to *Euphorus* Nees, Muesebeck (1958) showed that *Leiophron* Nees is the correct name. *Leiophron plagiognathi* keys to part 6 of

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Muesebeck's (1936) key to Nearctic species of *Euphorus* by its hairy face, impressed prescutal sutures (=notaulices of Snodgrass, 1935), and venation. It differs from *levifrons* (Muesebeck) and *pallipes* Curtis by characters given in the following description, and from *scitulus* (Cresson), which it closely resembles, by a longer radial cell, shape of the propodeum and petiole, and presence of the nervellus of the hind wing.

Holotype female.—(Terms after Richards, 1956). Head amber; ocellar triangle reddish-brown; first segment of flagellum testaceous, rest dusky. Thorax laterally fuscous with lower episternum testaceous, dorsally piceous; pronotum fusco-testaceous. Legs concolorous with head; posterior tibia and first tarsal segment dusky; pretarsus piceous. Wings (fig. 1) hyaline; veins clearly demarcated but pale; stigma light brown with pronounced hyaline area basally. Gaster dark, reddish-brown. Length 2.1 mm.

Antenna shorter than head and thorax; third antennal segment 1.5 times longer than first and fourth; flagellum (fig. 2) 16-segmented, robust, segment I 1.2 times longer than scape and 2.0 times as long as pedicel, apical segments 1.6 times wider than segment I. Head (figs. 4, 5) transverse, 1.3 times broader than long; lower face with silvery-white appressed hair, 1.2 times longer than wide from base of antennal socket to base of clypeus; malar space 0.8 times as long as basal width of mandible; upper face with sparse setae and minutely punctate, temples and vertex shiny with sparse, fine setae; ocular-ocellar line slightly longer than postocellar line; frontal line distinct but not prominent; ocellar triangle faintly rugulose.

Thorax not quite as broad as head; prescutum of mesonotum shiny, sparsely setose, shallowly punctate, prescutal sutures complete, narrow, well-defined; lateral lobes of prescutum shiny, impunctate; scutellum smooth, impression at base divided by a median septum; pronotum rugulose; mesepisternum smooth with rugulose patches below wing process and along the anterior margin next to the pronotum; propedeum rugose reticulate and with fine, erect hair; spur of hind tibia as long as segment III of hind tarsus, and 0.8 times as long as segment II; first abcissa of radius very short; stigma 2.3 times as long as broad; length of radial cell slightly less than one-half that of stigma but about as broad; submediellan cell complete (fig. 9), nervellus one-half as long as basella, slightly longer than longest marginal cilia of hind wing.

Abdomen smooth and polished; petiole (fig. 3) faintly rugulose basally, striate apically, 1.7 times as long as apical width, spiracle slightly behind middle; ovipositor subexerted.

Allotype male.—Similar to female except in following characters. Length 2.2 mm, pronotum and mesepisternum amber, concolorous with head, thorax dorsally fuscous, gaster light reddish-brown, face 1.4 times longer than wide, malar space and basal width of mandible about equal, length of ocular-ocellar line equal to postocellar line, areas of mesepisternum near wing process and on ventral margin towards pronotum somewhat punctate as well as slightly rugulose, radial cell slightly longer than one-half the length of stigma and one-third longer than breadth of stigma, nervellus slightly shorter than longest marginal cilia of hind wing, petiole 1.8 times as long as apical width.

Variation—females.—Length 2.2–2.5 mm; flagellum 17–18-segmented; length of face 0.8–1.3 times its width; malar space 0.8–0.9 times as long as basal width of mandible; postocellar line slightly greater or smaller than ocular-ocellar line; radial cell 0.3–0.5 times as long as stigma; petiole 1.5–1.8 times longer than apical width; head, pronotum, mesepisternum amber to piceous.

Variation—males.—Length 2.3–2.4 mm; flagellum 16–18 segmented; face slightly wider than long; malar space equal to or slightly less than basal width of mandible; radial cell 0.3–0.5 times as long as stigma; mesepisternum testaceous to amber, in some specimens not concolorous with head and pronotum.

Specimens seen.—7 males, 6 females.

Type locality.—Three miles west of Belleville, Ontario.

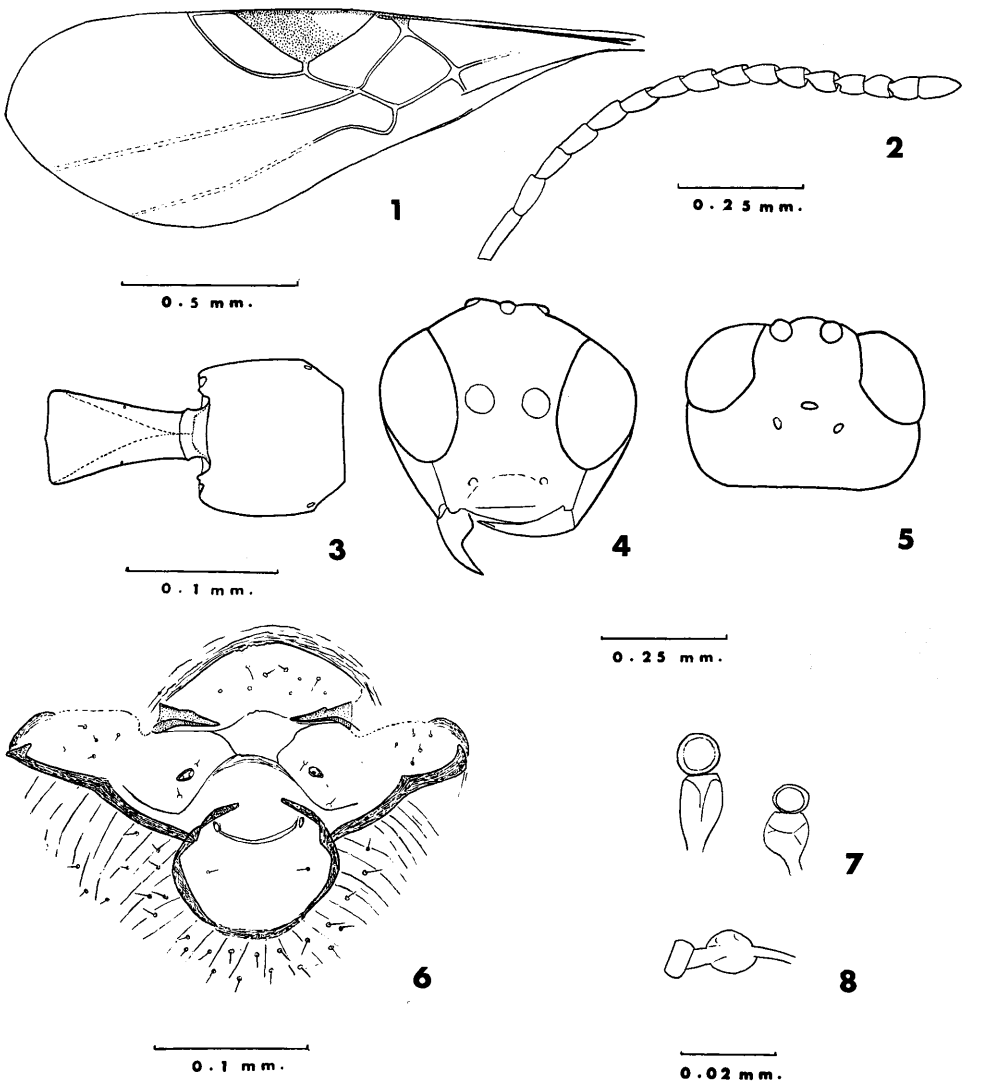
Holotype.—Female, Belleville, Ontario, May 31, 1962, C. C. Loan, reared from adult *Plagiognathus* sp. on *Spirea latifolia* L. (Canadian National Collection).

Allotype.—Male, same data as holotype but reared June 3, 1963 (C. N. C.).

Paratypes.—3 males, 2 females swept from *S. latifolia* at Belleville June 8, 1962 (C. N. C.); 1 male, 1 female swept from vegetation near Fuller Creek, Ontario (Huntingdon Township, Hastings County), June 20, 1963 (C. N. C.); 1 male, 1 female swept from *Cornus stolonifera*

Michx., Belleville, May 23, 1961 (C. N. C.); 1 male swept from *S. latifolia*, Belleville, June 11, 1963, and 1 female, same data but collected June 16, 1963 (United States National Museum).

The final instar larva of *L. plagiognathi* is typically euphorine in form, and development of head sclerites (fig. 6). There are, however, no concentric lines of



Leiophron plagiognathi sp. n., adult and final instar larva.

FIGURE 1. Front Wing.
FIGURE 2. Flagellum.
FIGURE 3. Propodeum and petiole.
FIGURE 4. Front view of head.
FIGURE 5. Dorsal view of head.
FIGURE 6. Front view of head of larva.
FIGURE 7. Dorsal view of spiracle.
FIGURE 8. Lateral view of spiracle.

setae on the raised dorsolateral folds of the body segments, nor groups of setae near the spiracles. The sclerites of the face are lightly sclerotized, especially the hypostoma which is barely perceptible. The stipital sclerites are slightly curved and project upward at a sharp angle from the labial sclerite; the maxillary stipes each have five outer setae. A hypostomal spur is not developed and postlabial

setae are short. The cuticle of the thorax and abdomen is densely covered by microsetae. The spiracles (figs. 7, 8) are small with a large closing apparatus close to the atrium.

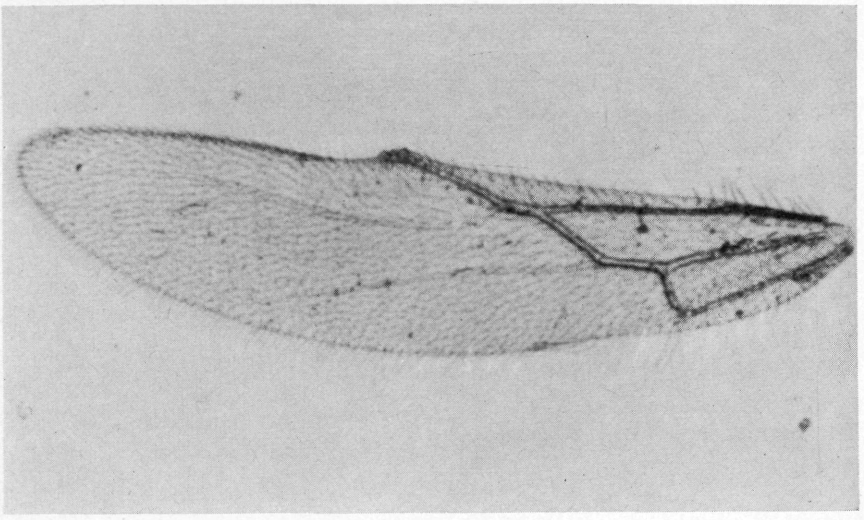


FIGURE 9. Hind wing of *Leiophron plagiognathi*.

LIFE HISTORY

The observations were made on material collected from *Spirea latifolia*, a shrub 5 to 6 ft high growing next to a willow slough in poorly-drained soil. Populations of *Plagiognathus* sp. and its parasite were most abundant on *S. latifolia*,

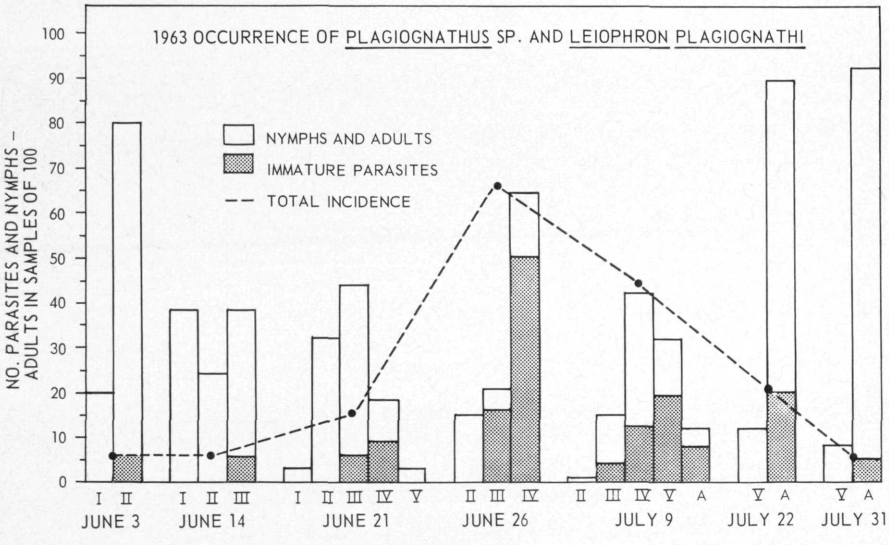


FIGURE 10. Occurrence of nymphs and adults of *Plagiognathus* sp. in samples of 100 individuals, and incidence of parasitism of *Leiophron plagiognathi* in each instar at Belleville, Ontario, Canada, 1963.

but nymphs and parasite adults were also collected from *Cornus stolonifera* Michx., *Salix* sp., and from a mixture of thick, creek-side vegetation that included *Vicia craca* L., *Solidago canadensis* L., *Eupatorium* sp., and a species of *Rubus*. *Plagiognathus* sp. apparently overwinters in the egg stage, as only nymphs were found in the spring and early summer. Southwood and Leston (1959) record the egg of *Plagiognathus* sp. as overwintering in England, as does Guppy (1963) for *P. chrysanthemi* in Canada. The nymphal stage consists of five instars (NI–V). The early ones are very small and light, pale green, and may be overlooked unless beaten onto a black sheet, whereas it is easier to see the larger nymph V with its wing pads, which are dusky apically.

TABLE 1

Number, stage, and instar of immature Leiophron plagiognathi *in field samples of* Plagiognathus *sp. at Belleville, Ontario, Canada, in 1962 and 1963*

Date	No. nymphs	No. adults	No. parasite eggs and larvae				
			Egg	LI	LII–III	LIV	Emerged
1962							
June							
22	92	0	3(1 NIII; 1 NIV; 1 NIV)	27(1 NII; 9 NIII; 7 NIV; 10 NV)	0	0	0
28	87	22	3(NV)	24(1 NII; 1 NIII; 4 NIV; 15 NV; 3A)	4(1 NIV; 3 A)	2(NV)	0
July							
11	26	132	0	15(1 NIV; 7 NV; 7 A)	0	3(A)	2(A)
16	7	114	0	7(2 NIV; 5 A)	2(A)	2(A)	0
24	0	56	0	0	1(A)	1(A)	0
27	0	53	0	0	1(A)	1(A)	0
1963							
June							
3	100	0	6(N II)	0	0	0	0
14	100	0	0	6(N III)	0	0	0
21	100	0	0	15(6 NIII; 9 NIV)	0	0	0
26	100	0	2(1 NIII; 1 NIV)	64(14 NIII; 50 NIV)	0	0	0
July							
9	88	12	0	37(4 NIII; 12 NIV; 19 NV; 2 A)	1(A)	2(A)	2(A)
22	12	88	0	0	0	20(A)	0
31	8	92	0	0	0	5(A)	0

Figure 10 shows the development of *Plagiognathus* and the incidence of parasitism of each instar, in 1963. The overwintered eggs hatched over a period of several weeks, as nymphs I were recovered in collections from June 3 to 21. The population of nymphs on June 3 was chiefly NII; on June 14, NI and NIII, with a large proportion of NII; on June 21, NIII; and on June 26, NIV (in samples of 100 individuals per collection date). Though nymphs V were present June 21, none was captured in the sample of June 26. On July 9, 32 per cent were nymphs V, and 12 per cent were adults. The population was predominantly adult by the third week of July. Thus, the developmental time of the nymph of *Plagiognathus* in 1963 was 5 to 7 weeks.

L. plagiognathi overwinters in cocoons spun up the previous summer in soil. The adults emerge in late spring; the earliest dates that adults were collected

were June 16, 1961; May 27, 1962; and May 23, 1963. Probably because nymphs I are too small to grasp for egg deposition, the female attacks nymphs II, at first, but later in the season nymphs III and possibly IV are also attacked. The incidence of parasitism (fig. 10) is cumulative, as larvae I are carried from one instar to the next into the adult plant bug. Table 1 gives the number of parasites of each instar recovered from nymphs and adults in dissection of material collected in 1962 and 1963. Larvae I parasites predominated in each nymphal instar. In most nymphs, the larva I was 0.20–0.24 mm long and undeveloped, but a few in nymphs V were as long as 0.38 mm. Larvae I in adult hosts varied in length and development, but some were 0.49 mm long and apparently mature. The development of the larva I parasite seems to be delayed until the host is adult, though a small proportion complete development in nymphs IV and V, as indicated in the collection of June 28, 1962. Parasites in nymphs collected June 22, 1962, were still immature larvae I 4 days after the nymphs became adults when held at 23 C. Fewer parasites were found in field-collected adults in July than one would expect from the incidence of nymphal parasitism. A reason for this might be that the collections were spaced too far apart to recover larvae I before they developed and emerged. It could also be that the population of host adults were diluted by adult *Plagiognathus* sp. flying into or out of the collection area.

The final instar larva of *L. plagiognathi* emerged throughout July in 1962 and 1963. There was no further parasite activity because the adult does not emerge from the cocoon until the following year.

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